Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Inquiry Regarding Carrier Current	)	
Systems, including Broadband over	)	ET Docket No. 03-104
Power Line Systems	)	
	)	

REPLY COMMENTS OF
CORTLAND E. RICHMOND, Jr.
to Comments of
SOUTHERN LINC,
SOUTHERN TELECOM, INC., AND
SOUTHERN COMPANY SERVICES, INC.
Dated 7 July 2003

These are Reply Comments of Cortland Richmond, Jr., to comments filed by Southern LINC, Southern Telecom Inc. and Southern Company Services, in this document referred to as "Southern."

Writer has been involved in EMC and EMI engineering since 1983, spent 21 years in the United States Army working with airborne and ground communications equipment, and has been an Amateur Radio operator since 1958.

These replies take the form of excerpts from Southern's original comment, noted as "Comment," followed by reply remarks, noted as "Reply." Each Comment and Reply is annotated by a Roman numeral. Replies commence immediately below.

I
Comment:
"BPL systems are a form of carrier current system that may be operated under Part 15 of the FCC's Rules. However, commercial development of these systems would greatly benefit from the removal of regulatory uncertainty. For example, equipment installed on medium-voltage electric lines should be defined as Class A digital devices. Standardized measurement procedures should also be adopted based on representative installations and statistical measures to help ensure that a high probability exists that the system as a whole will comply with the applicable emissions limits. Finally, Southern recommends that the Commission continue to rely on radiated emissions testing for Access BPL to the exclusion of conducted emissions testing."

Reply:
Southern here asks measurements insure the system as a while "comply with the applicable emissions limits." However, Southern also asserts at footnote 30 of its comment elsewhere that it is not the system as a whole which might generate interference, but only "identifiable RF devices on discrete power lines. " These statements are incompatible with each other.

II
Comment:
"... At present, the primary means by which Southern identifies the location and extent of a system outage is through trouble calls initiated by its customers. With the installation of intelligent devices on the power grid and the use of BPL, Southern would be able to immediately identify the areas affected by an outage and, depending on the devices placed on the network, the most likely point at which a circuit is down or a piece of equipment is malfunctioning. Just being able to identify with more precision the location of an electric system fault could save minutes, if not hours, of time in restoring service. A communications pathway coextensive with its electric grid would also mean that Southern could install equipment with the capability to remotely control additional aspects of the power grid without dispatching a crew. All of these activities mean higher reliability in electric service, better quality electric service, and reduced operating cost. As a regulated utility, such cost reductions would benefit Southern's ratepayers."

Reply:
BPL is not necessary to make use of remote reporting; existing Part 15 carrier current PLC systems, which, unique among all other Part 15 devices, are protected against interference by Commission policy, are available for that purpose. Southern in its comment appears not to have taken advantage of that availability, or, if it has, seems to have failed to make note of it.

III
Comment:
“According to the FCC’s most recent statistics, 29% of the zip codes in the United States are served by no broadband services providers or at most one. Moreover, in a number of states, the percentage of zip codes with one or fewer broadband providers exceeds 40%.“

Reply:
Southern's measurement mode seems designed to emphasize lack of service without taking into account reasons why service does not exist. Moreover, it invites conclusions with regard to broadband competition using data that is being rendered less accurate even as we type.

IV
Comment:
“Thus, while broadband access appears to be increasing nationally, significant areas of the country today still lack any type of broadband access or any competition among broadband service providers. Access BPL could help to further increase the availability of broadband connections and improve the competitiveness of the broadband access market.”

Reply:
The paucity of broadband connections in many places has not been due to an inherent lack of competition, but to the combination of an economic and telecom regulatory climate which has rendered initial deployment (which begs the question how competition COULD exist before deployment) unacceptably risky. This writer has participated in design of broadband equipment whose deployment was delayed for a considerable time due to these considerations. While wired and optical-fiber broadband was thus stalled, wireless broadband moved in, with the result that, for example, in the neighborhood where the writer lives, there are now two broadband providers where not long ago there were none. Soon, the economic survival of any one provider will be hostage to the other, and introducing another competitor may prove the straw that breaks this particular camel's back for all of them.

It is noteworthy that wishing to move into BPL require relief from Part 15 in order to make their proposals economically viable. No other broadband technology requires this.

V

Comment:

“There are at present two principle means of using BPL to provide broadband Internet access that rely upon two different network architectures: (1) a customer may receive broadband services by either plugging a small, inexpensive modem into any electric outlet in the home or business and connecting that modem to the Universal Serial Bus ('USB') or Ethernet port of a computer; or (2) by installing an 802.11 ('Wi-Fi') transceiver in an expansion port of the computer and connecting wirelessly to a Wi-Fi transceiver mounted on utility plant and using BPL on the medium-voltage distribution lines to provide back-haul of signals to an aggregation point, such as at the electric substation. In either architecture, communications signals are transmitted along the electric power lines using RF energy imposed on the lines through safe inductive coupling techniques. Although one of the major impediments to the deployment of BPL has been devising techniques to efficiently pass the BPL signals through or around stepdown electric transformers, which tend to act as natural filters of these signals, a number of safe and effective technologies have now been developed to overcome these difficulties, including, as mentioned above, the use of Wi-Fi transceivers to wirelessly provide the “last hundred meters” of service to the customer.”

Reply:

Southern plans to make use of 802.11 “Wi-Fi” transceivers for the last hundred meters to subscribers. However, it fails to note that others are already doing so, and does not explain how it proposes to mediate interference between these unlicensed, unprotected links.

VI
Comment:
"There are three distinct components to an Access BPL system:
1. Medium voltage (1,000 to 40,000 volts) distribution lines from the electric substation to each neighborhood;
2. Electric transformers close to consumer locations to step-down the voltage to 220/110 volts; and
3. Feeder lines from the transformer into fuse boxes or circuit breakers in homes or businesses, for delivery of electricity to outlets and fixtures within the premises."

Reply:
Unless power lines are buried, they are not suitable carriers of radio frequency energy. Radiation losses are excessive, causing interference, and they are susceptible to ingress to an extraordinary degree, so much so that the Commission recently declined to grant an Amateur radio allocation in the long-wave band for fear that it might interfere with utility Part 15 carrier current PLC systems. Since HF PLC systems would perforce coexist with more powerful emitters than the proposed Amateur allocation at long-wave, this bodes ill for its success.

VII
Comment:
"Implementation of BPL offers the potential for widespread, economical extension of broadband communications capability to anyone served with an electric outlet.[5] Because there is no need to install additional lines, BPL can be deployed without the need to trench along or through city streets, one of the most costly, time-consuming, and controversial aspects of bringing new, facilities-based competitive services to consumers. Moreover, distribution of BPL signals within the home or building has been facilitated through the commercial availability of consumer equipment conforming to industry standards for such in-building networking using existing power lines. This relative ease of facilities deployment, combined with use of existing standardized technology, make BPL a very attractive and viable facilities-based option in the broadband market."

Reply:
Southern relies on the existing penetration of utility wiring to argue that is has access already. Municipalities usually will not issue certificates of habitation for dwellings lacking electricity, nor would most of us wish to live without electrical service. But relying on the access to dwellings thus provided is spurious; one might as well say that access to milk could be improved by distributing it through the similarly pervasive potable water system.

VIII
Comment:
“Access BPL Is a Competitive Broadband Platform That Would Benefit From Removal of Regulatory Uncertainty”

Reply:
Contrarily, Access BPL seems not competitive until freed of regulations protecting radio services in United States, as witness Germany's similar experience with PLC systems.

IX
Comment:
“Southern does not believe it will be necessary for the FCC to designate specific spectrum for use by Access BPL or In-House BPL. As noted above, the characteristics of In-House BPL are becoming standardized, and Access BPL systems can be designed to avoid conflict with In-House BPL systems or, in some network architectures, to be fully compatible with In-House BPL. If the FCC were to designate discrete frequency bands for each type of BPL, it might unnecessarily foreclose innovative network designs.”

Reply:
Southern omits to note that where BPL-like systems have been deployed, it has been necessary to designate discrete frequency bands by default, by restricting the power allowed at frequencies allotted to certain radio services.

X
Comment:
“Southern's research indicates that, depending on the particular vendor's design, data transmission rates for Access BPL can range from 250-500 kbps on the low end to speeds that are about twice as fast as the current generation of cable modems. It is also important to note that Access BPL systems are generally designed to provide symmetrical
transmission rates, meaning that in contrast to DSL and cable modem subscribers, BPL users will be able to upload data at the same rate as they can download. The availability of high data rates on both the upstream and downstream paths makes BPL ideally suited for some of the newer applications on the Internet, such as IP telephony and multi-player interactive video games.”

Reply:
Access BPL will necessarily have to occupy far greater bandwidth than is delivered by ADSL or Cable modems, as it must serve many more than one or two customers. It is this which makes Access BPL incompatible with HF radio use; it will need to occupy the whole HF spectrum merely for the present information needs of the population served.

XI
Comment:
“Testing so far has focused on providing Ethernet-based services using standard Internet type protocols (*e.g.*, TCP/IP). Different vendors use different modulation schemes, but the particular modulation scheme used seems to have no effect on the ability of the system to comply with the FCC's Part 15 emissions limits.”

Reply:
As the American Relay League studies and overseas experience have shown. existing standards, when applied to a widespread electric power wiring plant, are far from adequate to protect communications and broadcast services.

XII
Comment:
“The existing Part 15 rules impose on Access BPL systems significant limitations intended to protect licensed users of the spectrum. Moreover, Part 15 rules include specific prohibitions on Part 15 devices causing "harmful interference."[29] Despite the early protests of a number of amateur radio licensees, companies that are developing Access BPL technologies or intending to deploy Access BPL fully understand that these systems are subject to a number of regulatory conditions intended to prevent harmful interference.”

Reply:
This writer joins others in acknowledging that existing Part 15 Rules are inadequate to protect some radio services at frequencies Southern and others wish to use for BPL.

XIII
Comment:
“The mere *potential* for interference should not be sufficient for the FCC to further restrict Access BPL deployment. Contrary to the contentions of the radio amateurs, the FCC's Rules in Part 15 do not impose a burden on the developer or user of a Part 15 device to demonstrate that the device will operate on an interference-free basis under all circumstances. Having to 'prove a negative' such as this would impose an impossible burden and effectively eliminate the potential for unlicensed devices to share spectrum with other radio services. In fact, Southern expects to participate in additional testing in the future to determine whether the Part 15 rules can be further relaxed with respect to BPL without creating harmful interference to other spectrum users. Southern believes that testing will show that these rules can be relaxed, which could greatly facilitate the provision of BPL to less populated areas.”

Reply:
Southern's contention notwithstanding, the potential for interference is the most visible regulatory obstacle to deployment. Part 15 requires that no harmful interference be created, and imposes a duty on those generating harmful interference to cease operation, even if the equipment concerned does meet the limits Part 15 imposes. There are adequate studies and even physical measurements showing that radio frequency power at the levels BPL would take are sufficient to cause harmful interference. It is disingenuous of Southern to seek to evade its responsibility by arguing the Commission must wait until the harmful interference is created before acting. One would not argue against the need to show (say) a drug free of addictive possibilities until after some number of people had become addicted to to it. The whole idea of regulatory compliance is in fact to prove the negative; there must be a reliable expectation that the regulated parameters (1) are sufficient to the task and (2) will be met.

XIV
Comment:
"As explained below, one of the more critical considerations is the method or methods by which compliance may be measured. Unless recognized, easily repeatable methods for measuring compliance exist, parties will lack confidence that their systems do, in fact, comply with Part 15. It is unnecessary, however, to define frequency bands to be avoided by Access BPL or to make other modifications to Part 15 in order to further protect licensed services. Southern is not aware of any reported cases of harmful interference from the use of this technology.[30] Access BPL is still at the initial stages of deployment, and to erect additional barriers to BPL operation at this point could signal the end of this promising new broadband access platform."

Reply:
Parties connecting to a wiring plant whose radiating configuration they do not control can never be certain their systems, which in this case must include the outside electrical plant as well as their own attached equipment, can comply with Part 15. Indeed, there is evidence to believe that they can expect the contrary to be so.

XV
Comment:
"... Thus, regardless of cost – and they are unlikely to be inexpensive due to the need for these devices to operate in extreme weather and electrical conditions – these devices are not the type that any consumer would install or use in a residential environment. In light of the factors discussed above, BPL components used outside the home and intended to be installed on or in close proximity to medium voltage power lines should be considered Class A digital devices and subject to the higher limits for such devices."

Reply:
Southern contends that Access BPL equipment should be regulated under Part 15's looser provisions as a Class A ITE, instead of Class B ITE. However, Southern ignores the fact that this equipment could (and must, if it does not use a radio frequency link to subscribers) introduce conducted currents oat Class A levels and (as carrier current equipment) above that level into residences the Commission presently protects at a Class B level.

XVI
Comment:
(30 A number of radio amateurs have commented that interference from electric power lines is difficult to identify and correct, and they suggest that Access BPL will be of the same type. These concerns are unfounded, however, because there are a multitude of locations on a normally functioning electric power system where RF noise can be detected by sensitive amateur radio receivers. By contrast, Access BPL will involve identifiable RF devices on discrete power lines and operating on specific radio frequencies or bands of frequencies.)

Reply:
Southern asserts at (30) that Access BPL will "involve identifiable RF devices on discrete power lines and operating on specific radio frequencies or bands of frequencies. " But Southern has already argued that BPL will not require specific frequencies or frequency bands. In addition, it is largely not their discrete devices, but the conductors over which their signals are distributed which would be the greatest problem. This writer contends that the Commission would be remiss in its duties if it did not consider the radiative efficacy of carrier-current BPL.

XVII
Comment:
Southern also recommends that emissions testing of Access BPL be based on average peak measurements, not quasi-peak measurements. The quasi-peak measuring method was developed in the 1930s to measure interference to broadcast radio reception.37 Accordingly, although quasi-peak measuring has evolved over the years, it is not clear whether it is the best method for analyzing the interference potential of something as advanced as Access BPL. Southern believes that the Commission should closely investigate this issue and give strong consideration to allowing testing of Access BPL to based on average peak measurements.

Reply:
The writer notes that quasi-peak constants currently in use were developed and adopted to account for interference effects on broadcast transmissions, rather than the other services which will need to be protected should BPL be deployed. Southern has requested the Commission specify use of an average detector in testing BPL emissions. Of the detection methods in use (peak, quasi-peak and average) the latter produces the lowest readings for broadband (high peak to average power ratio) signals. It does not protect services who use modulations susceptible to high peak-to-average interference signals, such as suppressed carrier single sideband, and frequency and phase shift narrow band data signals. To protect these kinds of signals, the writer urges the Commission require use of a peak detector for BPL measurements.

XVIII
Comment:
Because Access BPL systems are expected to operate above 1.705 Mhz, conducted emissions limits will not apply. Access BPL, by its very nature, involves placing RF energy onto electric power lines, so measurement of radiated emissions is the most direct way of understanding the interference potential of the system. Southern, therefore, recommends that the Commission continue to rely on radiated emissions testing for Access BPL to the exclusion of conducted emissions testing.

Reply:
Radiated emission testing has proven the most difficult to perform where the configuration of Equipment Under Test, and its radiators, is uncertain. One would be hard pressed to find a radiating configuration less certain than the electrical power line plant. Southern has nevertheless requested the Commission consider only radiated emission testing for BPL. Radiated emission testing will be needed to ascertain the suitability of BPL systems where victim equipment is susceptible to on-channel radiated interference. However, it is also appropriate to require conducted emissions testing, as equipment presently powered from the power lines – some of it critical equipment -- is in many cases susceptible to radio frequency energy on those power lines.

End of Reply Comments of Cortland E. Richmond, Jr. to Southern LINC (etc.)

The writer desiring that the Commission examine Southern's comments with the above in mind, these replies are respectfully submitted,

Cortland E. Richmond, KA5S

23 July 2003